

Our research mitigates environmental hazards and repairs environmental damage

Mission	Livermore's Environmental Programs conduct multidisciplinary research to assess and mitigate environmental and human risk from natural and man-made hazards and to develop and demonstrate new tools and technologies for environmental restoration.
Broad-Ranging Environmental Research	<p>Much of the science and many of the technologies now being used for environmental research originated in the nuclear weapons program. Livermore's earliest meteorology efforts were conducted to ensure that prevailing winds would not carry radioactive debris from atmospheric tests over populated areas. With the advent of underground testing, Livermore began studies in geology, geochemistry, and geophysics to ensure containment of the underground nuclear blasts. The Atmospheric Release Advisory Capability (ARAC) was initially established, using codes and scientific understanding developed in the weapons program, to predict and track releases of radioactivity to the atmosphere. Environmental remediation efforts were begun to clean up the legacy wastes of 50 years of nuclear weapon production.</p> <p>In collaboration with other federal agencies, we now have multidisciplinary project teams investigating all facets of the environment, from deep within the Earth to the land surface and from groundwater to the upper reaches of the atmosphere. Current areas of research include:</p> <ul style="list-style-type: none">• Atmospheric radiative transfer, chemistry, dynamics, and climate processes.• Physics of the atmospheric boundary layer and cloud processes.• Seismic processes.• Geochemistry and geophysics.• Pathway, dosimetry, and risk analysis of radioactive and toxic substances.• Isotopic and ion beam sciences.• Modeling of subsurface flow and transport.• Subsurface imaging and characterization.• <i>In situ</i> environmental remediation using natural and engineered processes.• Design, analysis, and testing of advanced waste-treatment technologies.
Benefits to the Nation	Our environmental programs range from emergency response activities to environmental policy assessments. Seismic studies, derived in part from underground nuclear testing research, have led to better design criteria for reactors and other critical structures. Geoscience studies have led to novel site-remediation technologies. Working in teams with other Livermore programs and directorates, we have developed new methodologies for water purification, waste treatment, and dose assessment from radionuclide exposure. Atmospheric science studies have helped

define international protocols for chemicals that are routinely released to the atmosphere. Other projects have led to the development of emergency-response capabilities for atmospheric releases of toxic material. For much of this work, we collaborate with other government agencies. For example:

- Stratospheric dynamics and chemistry—Federal Aviation Administration.
- Global chemistry—NASA.
- Geology and geoscience—U.S. Geological Survey.

Recent Accomplishments

- Operation and continuing development of the Atmospheric Release Advisory Capability (ARAC), a Department of Energy emergency response resource that has been used in the Three Mile Island and Chernobyl nuclear reactor accidents, the Persian Gulf War, a sulfuric acid plume from a refinery spill, and numerous other incidents and emergency-response exercises.
- Leading participation in the Program for Climate Model Diagnosis and Intercomparison (PCMDI), an international climate research program.
- Development and operation of the Center for Accelerator Mass Spectrometry (CAMS), an international user facility for isotopic studies for global climate, food mutagen, archaeological, and other research.
- Development and demonstration of capacitative deionization using carbon aerogel electrodes, an innovative water purification technology.
- Design of the Mixed Waste Management Facility, a pilot-scale waste-treatment demonstration facility.
- Development and demonstration of dynamic underground stripping and microbial filtering for *in situ* site remediation.

Technical Excellence

Livermore's broad range of scientific and technical excellence, together with its ability to integrate those skills into multidisciplinary teams, provides an excellent resource for addressing complex environmental issues. Our achievements exemplify Livermore's hallmark ability of turning scientific concept into working prototypes and problem solutions. Much of our work is focused on determining and mitigating the risks and impacts of natural and man-made hazards and on remediating environmental damage. We also provide science and technology that supports Livermore's environmental compliance requirements. A number of our projects address environmental issues of global significance, and many of our scientists are participants on national and international science and policy committees.

Contact

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